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Abstract

This paper reports on a study of ERP lifecycle major issues from the perspectives of individuals with substantial and diverse involvement with SAP Financials in Queensland Government. A survey was conducted of 117 ERP system project participants in five closely related state government agencies. A modified Delphi technique identified, rationalized and weighed perceived major issues in ongoing ERP life cycle implementation, management and support. The five agencies each implemented SAP Financials simultaneously using a common implementation partner. The three survey rounds of the Delphi technique, together with coding and synthesizing procedures, resulted in a set of 10 major issue categories with 38 sub-issues. Relative scores of issue importance are compared across government agencies, roles (client vs implementation partner) and organizational levels (strategic, technical and operational). Study findings confirm the importance of this finer partitioning of the data, and distinctions identified reflect the circumstances of ERP lifecycle implementation, management and support among the stakeholder groups. The study findings should also be of interest to stakeholders who seek to better understand the issues surrounding ERP systems and to better realise the benefits of ERP.

Keywords: ERP, ERP Life-cycle, Delphi Method, Key IS Issues

1. Introduction

Organisations worldwide are moving away from developing Information Systems (IS) in-house and are instead implementing Enterprise Resource Planning (ERP) systems and other packaged software (Price Waterhouse IT Surveys, 1995; AMR Research, 1998; IDC, 2000). ERP is a business operating system that enables better resource planning and execution, and improves delivery of value-added products and services to customers. ERP systems have, in recent years, begun to revolutionise best practice business processes and functions. ERP systems automate core corporate activities such as manufacturing and the management of financial, and human resources and the supply chain, while eliminating complex, expensive links between systems and business functions that were performed across legacy systems (Gable et al. 1998; Bingi et al., 1999; Rosemann and Wiese, 1999; Klause et al., 2000). Therefore, if adequately integrated into organizational use of information technology (IT), ERP also represents significant strategic value by speeding up decision making, reducing costs and giving users control over the entire business process.

Although increasingly prevalent, and despite warnings in the literature (e.g., Martin, 1998; Gable et al., 1998; Davenport, 1998; BCG, 2000) many organisations apparently continue to

underestimate the issues and problems often encountered throughout the ERP life cycle. For examples: (1) more than 40% of large software projects fail; (2) 90% of ERP implementations end up late or over budget; (3) continuing shortages, high costs and concomitant turnover of ERP staff; (4) growth in ERP consulting services has led to a proliferation of methods, techniques, and tools for conducting ERP implementation projects; and (5) 67% of enterprise application initiatives could be considered negative or unsuccessful.

ERP life cycle-wide management and support are ongoing concerns rather a destination. The pre-implementation, implementation and post implementation stages continue throughout the lifetime of the ERP as it evolves with the organization (Dailey, 1998). Unlike the traditional view of operational IS that describes a system life cycle in terms of development, implementation, and maintenance, examination of ERP implementations is revealing that their life cycle involves major iterations. Following the initial implementation there are subsequent revisions, re-implementations and upgrades that transcend what is normally considered system *maintenance*. As the number of organisations implementing ERP increases and ERP applications within organisations proliferate (Davenport, 1996; Bancroft, 1998; Hiquet et al., 1998; Shtub, 1999), improved understanding of ERP life cycle implementation, management and support issues is required so that development, management, and training resources can be allocated effectively (Gable et al., 1998). A better understanding ERP life cycle issues will also help direct the ERP research agenda.

Although ERP sales in 2000 declined for the main vendors (eg., SAP, Baan, ORACLE, JD Edwards, Peoplesoft) due to Y2K curtailment in IT/IS activity and to saturation of large organisations, the outlook through to 2004 is for a compound annual growth rate of 11.4% for license, maintenance, and related service revenue associated with enterprise resource management applications (IDC, 2000). This sustained interest in implementing and realizing the benefits of ERP systems, and the consequent life cycle issues, provide the rationale for this study (this need is further outlined in Gable et al., 1997a; 1997b; Gable, 1998; Gable et al., 1998).

The paper proceeds as follows. First, the study background is described. Second, the research methodology is related. Third, study results are presented. Fourth, implications of the study findings are explored. Lastly, several broad conclusions are drawn.

2. Background of the Study

2.1 Whole of Government Initiatives

In 1983, the Queensland Government Financial Management System (QGFMS) was successfully implemented to provide a common financial management system to all Queensland government agencies. A decade later in 1994, the government reaffirmed strong support for central co-ordination of financial information systems as a fundamental strategy underpinning sound financial management in the government budget sector. These activities created benefits associated with co-ordination and economies of scale. They include the provision of timely, current information on a government or sector-wide basis and cost savings in the areas of training, relocation of staff, single-point market investigation, development and support (Financial Management Strategy, 1994).

The Queensland government is committed to delivering high quality, client-responsive services while maximizing value for money in their delivery. It was observed that, to be effec-

tive, QGFMS must continually evolve to support new initiatives aimed at improving the budget sector's effectiveness. Three related initiatives currently shaping the budget sector environment, are: (1) program management, accrual accounting and accrual output budgeting. These initiatives are being implemented across departments through *Managing for Outcomes* (MFO) - an integrated planning, budgeting and performance management framework (Financial Management Strategy, 1998).

An ERP system, SAP Financials, was chosen in 1995 to become the "new generation" of QGFMS. The SAP system was selected to enable government agencies' access to a fully integrated business solution that was both Year 2000 compliant and would do more than just manage agency financial information. By late 1999, the Queensland government had implemented this system across all 28 state government agencies.

2.2 Motivation for the Study

Although SAP Financials had been established in some agencies for a considerable period, new issues associated with the system's ongoing support and evolution, continue to arise. A standard accounting environment driven by central government (Treasury) regulation, combined with other centrally driven reporting requirements as well as the same software (SAP) existing across all agencies, provided an excellent opportunity to research in ERP related issues. All key players (software vendors, implementation partners and user organisations) in ERP life cycle implementation, management and support can potentially benefit from a better understanding of these issues. ERP software vendors seek to redress negative perceptions that ERP implementation duration and costs are difficult to manage, and to improve ongoing customer support and satisfaction. Consulting firms seek to streamline implementation and share in the savings with clients. Both software vendors and consultants seek to increase the size of the ERP market through reduced costs and increased benefits to clients. Also, when software vendors and their implementation partners are more attuned to the issues identified, they will be well placed to further support clients throughout the ERP lifecycle. Potential benefits to clients from identifying and analyzing ERP life cycle related issues include: rationalized and more effective support from both the software vendor and implementation partner; improved ability to react to a changing environment; lower costs; and ERP systems that more accurately reflect business needs.

For information systems management community members (e.g., professional societies, educators, trainers, researchers) to effectively serve the community, they must be aware of major ERP life cycle issues. Professional societies serve the community by arranging conferences, sponsoring guest lectures and disseminating information through their publications. Educators and trainers need information on key issues to create graduates with the necessary skills to address these concerns. Researchers will be more successful in attracting sponsorship if they undertake studies that are closely aligned to the concerns of the marketplace.

Clearly there is a need for further research aimed at identifying the specific client-centred ERP lifecycle implementation, management and support issues faced by all levels and all roles in organisations. The extensive deployment of ERP in private and public sector and the rapidly growing and changing portfolio of software applications on which Queensland government is dependent, magnify the imperative.

3. Methodology

3.1 Objectives of the Study

The research described in this article has several objectives. First, the research is designed to understand and explicate the major issues in relation to the ERP lifecycle within five Australian state government agencies that implemented SAP Financials, as a team. In order to obtain a broad view of these issues, a Delphi-type method was adopted to systematically identify and determine the major issues from the perspectives of individuals who had been closely involved with SAP Financials implementation, management and support. Second, the research highlights areas of consensus and difference among the stakeholder groups. Very little work has examined whether a shared concern of major ERP issues exists between implementation partner and client, and at different levels of the organization. Third, the study serves to focus discussion and promote constructive interaction to develop an increasingly sophisticated understanding of the nuances of ERP lifecycle implementation, management and support generally, and of implementation within the public sector in particular.

3.2 Data Collection

A three-round, non-anonymous Delphi type survey was conducted, using personalized e-mail with attached survey instruments. The Delphi method was critiqued in the context of IS key issues studies and its application within the context of the current study is discussed in Chang and Gable (2000). The objective of the first round of the Delphi survey was to "inventory" issues experienced. After structuring a preliminary set of major issues, a second survey round sought further comments and confirmation of this synthesized set of major issues. After reviewing feedback from round two, a final round requested respondents' scores on the relative importance of the major issues.

In the process of coding and synthesis the survey responses, several potential coding schemes were examined and tested. Attempts to map the data onto existing models (e.g., the MIT90s framework, the ERP life cycle) failed to provide a satisfactory level of discrimination between substantive issues. Subsequently, an open coding approach was adopted as a means of structuring the issues identified in the first survey round. The major strength of the open coding approach is that it is data driven - the categories so formed reflect the range of issues that were collected as data rather than some pre-defined scheme. Because the categories are determined from the data themselves, respondents should comprehend them more readily in subsequent survey rounds (the strengths and weaknesses of potential coding methods and synthesis procedures have been debated in Chang et al., 2000).

Two coders were involved in the open coding procedure. This involves each coder working individually through the open coding and synthesis procedures, and then comparing the individual's results from each coder and resolving differences into a preliminary set of major issues. Using a variation of the nominal group technique, a panel of domain experts from the government agencies then examined the resulting master set of major issues to establish the coding reliability and content validity. Discrepancies were discussed with the research team.

3.3 The Study Sample

Individuals from the implementation partner (a "big 5" Consulting Firm) and five closely related government client agencies were pre-identified and contacted for study participation. To qualify for study participation, they were required to possess substantial and diverse involvement with SAP Financials: at any level, in any role, in any phase of the lifecycle, with

any of the modules implemented. 117 individuals were identified and included in the contact database, based on a defined Survey Participants' Selection Guidelines, and through interviews of senior sponsors in each agency.

4. Study Findings

4.1 Round 1 (Inventory Round)

Table 1 - 1st Round Response by Organisation, Role, Level of

	Response	% of Row	% of Total
Organisation			
Consulting Firm	7	30	11
Agency A	27	75	44
B	12	57	20
C	7	70	11
D	2	15	3
E	6	43	10
Total	61	52	100
Role			
Partner	13	39	21
Clients	48	57	79
Total	61	52	100
Level			
Strategic	13	68	21
Technical	9	39	15
Operational	39	52	64
Total	61	52	100

Before the e-mailout, the survey instrument (Word attachment) and covering email, were pre-tested for clarity and ease of understanding with several senior personnel in the government agencies. Minor cosmetic changes resulted. 78 questionnaires were returned, yielding a 67 % response rate. A total of 61 valid questionnaires were eventually obtained from the first round survey (Table 1) providing a net response rate of 52%. Known reasons for non-response included: some respondents had discontinued their SAP responsibilities; others had left the organisations or were on holiday/materiality leave; several respondents did not want to participate because of the time required to complete the questionnaires. Several staff of Agency A played a lead role on the SAP Financials implementation and acted as "implementation partner" in close cooperative with the consultant. It is observed that 21 % of respondents from the Consulting Firm (7) and from the Agency A (6) played the role of implementation partner and therefore were involved across all five agencies' project. Note that the term ‘client’ herein refers to employees of the Agencies, whom are ‘clients’ of both the ERP vendor and the implementation partner. Sixty-four percent of respondents represent the operational level (e.g., business process team member, power user, help desk team member), 21% the strategic level (e.g., steering committee member, project sponsor, project manager) and 15% the technical level (e.g., system developers, system administrator) respectively.

Respondents were asked to indicate which of six lifecycle phases, and which of eight SAP Financial modules they had been involved in. Table 2 shows the distribution of respondents' involvement by phase, module and duration. Results indicate that respondents have been involved across all phases of the lifecycle. The majority of respondents (80%) indicated less than 2 years experience of the ERP lifecycle. This is likely due to: (1) the relatively recent prevalence of ERP, (2) the relatively brief history of ERP within the five government agencies, and (3) the dearth of ERP expertise at the time of the study (e.g. sometimes resulting in relatively junior staff of the implementation partner being put forth as "experts"). The systems under study were the first ERP experience for most Agency employees.

Table 2 - Involvement by Phase, Module and Duration

Phases	%	Modules	%	Duration	%
Plan	10	General Ledger	17	< 1 Year	39
Design & Build	13	Accounts Receivable	13	1 to 2 Years	41
Testing	18	Accounts Payable	20	2 to 3 Years	15
Implementation	17	Fixed Assets	10	3 to 5 Years	5
Knowledge Management	14	Controlling	12		
Up-and-Running	28	TR/FM	7		
		Materials Management	9		
		Projects	8		
		Others	4		
Total	100	Total	100	Total	100

Essentially, 274 issues were identified from the 61 respondents, or 4.5 issues per respondent on average. Table 3 shows approximately 42% (115) of issues identified were derived from Agency A. This is unsurprising given the lead role played by that Agency in the SAP Financials implementation, and given that 44% (27) of total respondents are from that Agency. The number of issues identified by Agencies versus Partners is proportionate to the number of respondents in these groups. Also, the number of issues identified is roughly proportional with the numbers of respondents at the operational, technical and strategic levels.

Table 3 - Distribution of Initial Issues by Organisation, Role & Level

	#	%
Organisation		
Consulting Firm	26	9
Agency A	115	42
B	48	18
C	34	12
D	14	5
E	37	14
Total	274	100
Role		
Partner	55	20
Client	219	80
Total	274	100
Level		
Strategic	78	28
Technical	27	10
Operational	169	62
Total	274	100

We next sought to distill from the 274 issues into a summary master set of major issues and related sub-issues. The coding and synthesis procedures resulted in a set of 10 major issue categories (Table 4) with 38 sub-issues (Table 6). The first round responses were broadly coded and synthesized: 64% of respondents identified 55 issues concerning Knowledge Management (e.g. difficult to retain people with SAP skills due to market pressure to leave), 49% of individuals referred to 50 issues in System Development (e.g. frequency of SAP upgrades places a large burden on system maintenance), 48% nominated 67 issues that related to Operational Deficiencies (e.g. operational deficiencies that impact the accuracy and efficiency of operations and ease of use of the system), 28% of respondents identified Organizational Context as a source of 28 issues (e.g. diversity of government systems makes integration difficult), 25% of respondents nominated 17 issues were associated with System Performance (e.g., inadequate to meet operational requirements), 20% of respondents suggested 20 issues specifically related to the implementation Costs and Benefits of the systems (e.g., complexity of SAP far exceeds the requirements of some agencies), and 20% of respondents specified, for example, ongoing Support for the SAP systems as inadequate. Finally, 28% of respondents indicated the remaining 8, 8 and 7 issues specifically related to the categories of Data Conversion, Lack of Consultation, and Reluctance to Accept Dissenting View respectively. Using the incidence of nomination as an early crude indicator, it would appear at this stage that ERP Knowledge Management is most problematic, followed closely by System Development concerns, Operational Deficiencies and others.

Table 4 - Ten Major Issue Categories

		Responses			
		Respondents		Issues	
Major Issue Categories	M-#	#	%	#	%
Knowledge Management	3	39	64	55	20
System development	9	30	49	50	18
Operational Deficiencies	5	29	48	67	24
Organisational Context	6	17	28	28	10
System Performance	10	15	25	17	6
Cost and Benefit	1	12	20	20	7
Support	8	12	20	14	5
Data Conversion	2	8	13	8	3
Lack of Consultation	4	6	10	8	3
Reluctance to Accept Dissenting View	7	3	5	7	3
Total		61	100	274	100

4.2 Round 2 (Confirmation Round)

The second round survey aimed to (1) report a preliminary set of major issues meant to capture the concerns of client organisations, as they would affect ERP life cycle implementation, management and support; (2) provide a structure of these synthesized issues that indicates relationships to the respondents' initial responses; (3) obtain comments and confirmation on the tentative set of major issues; and (4) finalize a master set of meaningful major issues that is relevant to study participant organisations and the IS community at large.

In order to examine and arrive at a best possible set of major issues and related sub-issues for a further "weights" round survey, a domain experts' workshop was conducted soon after derivation of the preliminary set of major issues and related sub-issues. Four out of five representatives from organisations and five research team members were agreed to participate in this panel workshop. This workshop was organized to allow time for information sharing and discussion with the participants as well as the presenters. The workshop yielded valuable insights and a greater level of understanding of issues with SAP Financials in the government agencies, and resulted in a tentative set of major issues and related sub-issues that are more relevant and meaningful to the study stakeholder groups. A number of indeterminate issues were resolved.

Having rationally synthesized and logically structured a tentative set of major issues, in this confirmatory/interim round we also sought respondents' comments on, and confirmation of this master list of issues. For each respondent from round one, a custom report was prepared. The report included the hierarchy of 10 major issues and 38 related sub-issues. The report also clearly indicated the linkage between each of the respondent's first round issues, and the major issues and related sub-issues with which we had associated. A total of 61 reports were distributed to individuals who had responded in the first round survey. To increase the response rate, the round two survey was also e-mailed to 39 non-respondents. Although participants were instructed that there was no need to formally respond if they agreed in principle with the preliminary set of major issues, about one quarter of questionnaires were returned showing their agreement with the tentative set of major issues and related sub-issues. A master set of major issues and related sub-issues was finally achieved.

4.3 Round 3 (Weights Round)

During September-October of 2000, 100 round-3 questionnaires were sent to survey participants, excluding those who in the previous survey rounds had indicated they were unable to participate. Respondents were asked to rate the relative importance of the issues. Prior to its e-mailing, the survey was pre-tested for clarity and ease of understanding by several senior personnel in the government agencies. Slight changes were made. Consistent with past IS major issues studies, respondents were asked to score each of the 38 sub-issues on a scale from 1 to 10 where 1 indicates the issue is "not important" and 10 indicates the issue is "very important."

Approximately one week after the due date, in an effort to boost the response rate, follow-up e-mail messages and phone calls were made to non-respondents. When necessary, a copy of the questionnaire was e-mailed to those respondents who had 'misplaced' the survey. The follow-up phone calls resulted in 15 additional returns. A total of 58 questionnaires were returned, yielding a 58 % response rate. 42 valid questionnaires were eventually obtained from the final round survey, providing a net response rate of 42%. All agencies, roles and organizational levels of involvement were represented. The distribution of the survey respondents in this final round survey by agency, role and organizational level is shown in Table 5.

Table 5 - 3rd Round Response by Organisation, Role and Level of

	Response	% of Row	% of Total
Organisation			
Consulting Firm	6	29	14
Agency A	15	48	36
B	7	44	17
C	3	38	7
D	3	30	7
E	8	57	19
Total	42	42	100
Role			
Partner	13	46	31
Client	29	40	69
Total	42	42	100
Level			
Strategic	13	72	31
Technical	4	21	10
Operational	25	40	60
Total	42	42	100

Table 6 - Sub-Issue Ranks

S-#	Mean	N=42	Std Dev	Rank	Sub-Issues	M-#	Major Issue Category
8	7.04	32	1.87	1	Training provided was inadequate and did not cover the diversity of circumstances encountered in normal daily	3	Knowledge Management
1	6.97	32	2.1	2	Complexity (& therefore cost) of SAP far exceeds the requirements of some agencies	1	Cost/Benefit
2	6.72	34	2.55	3	Complexity of SAP drives costs beyond reasonable limits	1	Cost/Benefit
10	6.54	34	2.73	4	System documentation is inadequate, particularly with respect to system design and controls	3	Knowledge Management
22	6.45	28	2.45	5	Lack of leadership at senior levels	6	Organizational Context
16	6.34	33	2.16	6	SAP is not sufficiently integrated with other systems	5	Operational Deficiencies
9	6.32	31	2.49	7	Shared knowledge among project team members was a problem - agency staff did not understand SAP and implementation personnel did not understand agency requirements	3	Knowledge Management
35	6.19	30	2.66	8	Requested system functionality was sacrificed in order to meet implementation deadlines	9	System Development
19	6.09	30	2.44	9	Differences in work ethic among project personnel	6	Organizational Context
15	6.07	30	2.09	10	Persistent minor errors and operational issues have not been rectified	5	Operational Deficiencies
11	6.04	27	2.64	11	Lack of consultation with operational level users meant that operation requirements were not met	4	Lack of Consultation
7	6.02	31	2.37	12	Insufficient resources and effort put into developing in-house knowledge	3	Knowledge Management
13	5.88	31	2.28	13	Not all required reports were available at implementation time	5	Operational Deficiencies
34	5.88	30	2.45	14	Issues that arose during, or result from, the development phase of the SAP system	9	System Development
18	5.80	32	2.72	15	Security is difficult to maintain in SAP resulting in some users being granted too much access and others not having	5	Operational Deficiencies
3	5.74	33	3.02	16	Costs of SAP exceed those of QGFMS without commensurate benefit	1	Cost/Benefit
33	5.74	31	2.96	17	Inadequate system testing left many errors in the implemented system	9	System Development
36	5.69	29	2.96	18	The project team was disbanded when the system was handed over despite many issues remaining unresolved	9	System Development
28	5.68	29	2.88	19	Ongoing support for the SAP system is inadequate	8	Support
37	5.57	32	2.53	20	Too little effort put into redesigning the underlying business processes, resulting in a system that represented a 'technology swap' that failed to capture many of the benefits of SAP	9	System Development
24	5.54	28	3.13	21	Political issues had a negative impact on the project	6	Organizational Context
17	5.47	29	2.53	22	SAP lacks some functionality of QGFMS	5	Operational Deficiencies
12	5.37	24	2.38	23	Developing reports is difficult in SAP	5	Operational Deficiencies
29	5.36	28	2.81	24	Support personnel are inadequately trained	8	Support
14	5.23	22	2.26	25	Operational deficiencies that impact the accuracy and efficiency of operations and the ease of use of the system	5	Operational Deficiencies
21	5.19	32	2.49	26	Implementation across multiple agencies led to sub-optimisation of the system configuration	6	Organizational Context
26	5.17	31	2.51	27	Timing of implement was inappropriate because of change underway in the public sector	6	Organizational Context
23	5.12	28	2.51	28	Lack of ownership/responsibility by agency personnel at the project level	6	Organizational Context
4	5.07	29	2.27	29	SAP implementation benefits do not justify costs	1	Cost/Benefit
31	4.98	25	2.88	30	Frequency of SAP upgrades places a large burden on system maintenance	9	System Development
30	4.87	26	2.94	31	Complexity of SAP means few, if any, people understand SAP beyond a single module, making overall design	9	System Development
38	4.79	30	2.84	32	System performance is inadequate to meet operational requirements	10	System Performance
5	4.65	34	2.85	33	Errors were found in data converted from former QGFMS	2	Data Conversion
20	4.53	29	2.28	34	Diversity of government systems makes integration difficult	6	Organizational Context
25	4.31	24	2.78	35	Poor communication between agencies	6	Organizational Context
32	4.21	33	2.75	36	Frequency with which requirements changed caused problems for developers	9	System Development
6	3.88	32	2.51	37	Difficult to retain people with SAP skills due to market pressure to leave	3	Knowledge Management
27	3.47	30	2.16	38	Organization appears unable or unwilling to be responsive to requests for changes in the system to resolve operational problems	7	Reluctance to Accept Dissenting View
Total	5.55	292	2.66				

In Table 6, an overall distribution, dispersion, and ranking of major issues and related sub-issues (i.e., the mean rating, standard deviation, and ranking of each synthesized major issues and sub-issue) were depicted. The ranking for the major issues and related sub-issues are simply based on the average of mean scores. A total of 1133 valid rating cases (71%) from 42 respondents were calculated (the 29% of missing/invalidate values in several rating cases are excluded) in order to measure the distribution, dispersion and ranking of each synthesized sub-issues.

In attention to the question, ***How do stakeholders rate the relative importance of these issues*?**, Table 6 shows overall rankings of the issues appeared to be relatively important than the rest of the sub-issues: (1) *training provided was inadequate and did not cover the diversity of circumstances encountered in normal daily operations* (7.04), (2) *complexity (&therefore cost) of SAP far exceeds the requirements of some agencies* (6.97), (3) *complexity of SAP drives costs beyond reasonable limits* (6.72), (4) *system documentation is inadequate, particularly with respect to system design and controls* (6.54), (5) *lack of leadership at senior levels* (6.45), (6) *SAP is not sufficiently integrated with other systems* (6.34), (7) *shared knowledge among project team members was a problem - agency staff did not understand SAP and implementation personnel did not understand agency requirements* (6.32), (8) *requested system functionality was sacrificed in order to meet implementation deadlines* (6.19), (9) *differences in work ethic among project personnel* (6.09) and (10) *persistent minor errors and operational issues have not been rectified* (6.07).

Detailed discussion of study findings under 10 major issue categories (Table 7) can be found in Chang and Gable (2001). Comparisons of sub-issues by government agencies, roles, and organizational levels of involvement are too presented therein.

Table 7 - Major Category Ranks

M-#	Mean	N=42	Std Dev	Rank	Major Issue Categories
1	6.16	128	2.60	1	Cost and Benefit
4	6.04	27	2.64	2	Lack of Consultation
3	5.96	160	2.62	3	Knowledge Management
5	5.78	201	2.35	4	Operational Deficiencies
8	5.53	57	2.82	5	Support
9	5.40	236	2.79	6	System development
6	5.32	230	2.62	7	Organisational Context
10	4.79	30	2.84	8	System Performance
2	4.65	34	2.85	9	Data Conversion
7	3.47	30	2.16	10	Reluctance to Accept Dissenting View
Total	5.55	1133	2.66		

4.4 Comparison of Sub-issues by Government Agency, Role and Organizational Level of Involvement

Since the comparison of sub-issues by government agency compares variable means (i.e., average mean ratings) for respondents of more than two different groups, we conduct a statistic procedure of Analysis of Variance (ANOVA) in attention to the question, "***Do respondents in each of the five government agencies have similar mean ratings?***" Analysis (N = 36) reveals broad agreement across the five agencies on the importance of the sub-issues. Significant differences are observed on 6 of the 38 sub-issues. The overall result shows respondents as a group of government agencies have similar views on most sub-issues under the 10 major categories.

ERP Knowledge Management related issues: (1) *system documentation is inadequate, particularly with respect to system design and controls*, and (2) *insufficient resources and effort put into developing in-house knowledge* were ranked the most important issue in Agency A and Agency B. The Operational Deficiencies related issues such as *SAP lacks some functionality of existing system* were placed as the most important issue in Agency C while the Cost

and Benefit related issues like *complexity of SAP drives costs beyond reasonable limits* were perceived as the most important issue by Agency D. The most important issues, which were Organizational Context related, to Agency E were *lack of leadership at senior levels*.

The *Scheffe* is employed as a conservative *post-hoc* comparison in determining which groups in between (if any) are different. We conclude that Agency A and Agency C had statistically significant different views on *errors were found in data converted from former QGFMS* (0.02). The Agency B and Agency E had significantly different views on *diversity of government systems makes integration difficult* (0.01). The Agency B and Agency C had significantly different views on *complexity of SAP mean few, if any, people understand SAP beyond a single module, making overall design decisions very difficult* (0.03).

Mean scores and ranks of the sub-issues were also compared by organisational level. System Development related issues like *requested system functionality was sacrificed in order to meet implementation deadlines* were ranked as the most important issue at the strategic level. The Organizational Context related issue; *political issues had a negative impact on the project* is placed as the most important issue of the technical level. The most important issues, which were ERP Knowledge Management related, to operational level were *system documentation is inadequate, particularly with respect to system design and controls*.

We also conducted a statistic procedure of ANOVA to answer the question, "***Do respondents in each of the three organizational levels have similar mean ratings?***" The overall result shows respondents (N = 42) have similar views on most major issues except the following 5 issues: (1) *SAP implementation benefits do not justify costs* in Cost and Benefit category; (2) *insufficient resources and effort put into developing in-house knowledge*, (3) shared knowledge among project team members was a problem - agency staff did not understand SAP and implementation personnel did not understand agency requirements, and (4) *system documentation is inadequate, particularly with respect to system design and controls* in Knowledge Management category; and (5) *too little effort put into redesigning the underlying business processes, resulting in a system that represented a 'technology swap' that failed to capture many of the benefits of SAP* in System Development category.

The *post-hoc* with Scheffe procedure comparisons revealed that technical and operational level personnel had different views which were statistically significant on the previous mentioned five issues while strategic and technical level personnel had statistical significant difference on issue of *insufficient resources and effort put into developing in-house knowledge* (0.04).

Finally, mean scores and ranks of the sub-issues from Implementation Partner staff versus Client staff were compared. To compare the average ratings of two groups of different subjects, the implementation partner (13) and client personnel (29), on one variable we conducted independent-samples *t*-test. We are interested in the question, "***Did the implementation partner and client personnel in the major ERP life cycle issues have similar mean ratings?***" Of these, one might expect clients to have an internal orientation, whereas implementation partners might have an external orientation. We had no prior expectations of the focus of consultants. There appears to be concurrence among client personnel that *complexity of SAP drives costs beyond reasonable limits* is the most important issues. In contrast, the implementation partner views *political issues had a negative impact on the project* as being the most important issue.

As the comparison shows that the probability values is greater than 0.05, we conclude that implementation partner and client personnel had similar mean scores in 26 of the sub-issues, such as *complexity (& therefore cost) of SAP far exceeds the requirements of some agencies*. In contrast, we found that these two types of personnel had different views on 12 of the sub-issues, such as *insufficient resources and effort put into developing in-house knowledge* and *complexity of SAP drives costs beyond reasonable limits*.

5. Implications

This study's primary limitation is the sample size of survey participants; although there were 61 responses at the first survey round and 42 responses at the final survey round correspondently from different individuals. The results, however, do show significant relationships among different individuals' experiences to the major ERP lifecycle implementation, management and support issues. The fact that issues and concerns come from independent participants in the study increases confidence in the results.

5.1 Implications for Client Users

ERP solutions are revolutionizing how organisations produce goods and services, by integrating an organization's different departments and functions, and ensuring smooth flow of information across the organization. ERP systems are very large and complex and warrant a careful planning and execution of implementation, management and ongoing support. They are not mere software systems; they affect how a business conducts itself. How an organization implements an ERP system, determines whether it creates a competitive advantage or becomes an organization headache. The top contributor for a successful ERP implementation is strong commitment from top management, as an implementation involves significant alterations to existing business practices and an outlay of huge capital investments. The other important factors are the issues related to reengineering the business processes and integrating the other business applications to the ERP backbone. Top management plays a key role in managing the change an ERP brings into an organization. Organisational commitment is paramount due to possible lengthy implementation and huge costs involved. Once implemented, an ERP system is difficult and expensive to undo. Since no single ERP solution can satisfy all the business needs, organisations may have to implement custom applications in addition to the ERP software. Integrating different software packages poses a serious challenge, and the integration patchwork is expensive and difficult to maintain.

Selecting and managing consultants pose a continuous challenge due to the shortage of skilled consultants in the market. ERP vendors are bringing out industry-specific solutions and newer methodologies to cut the length and costs of implementation. It is suggested, organisations could reduce the total cost of implementation if they reduce customization by adapting to the ERP's built in best practices as much as possible. Selecting the right employees to participate in the implementation process and motivating them is critical for the implementation's success. Additionally, it is important to train the employees to use the system to ensure the proper working of the system.

5.2 Implementation for Consulting Firms and Vendors

Because the ERP market demand has grown so dramatically during the last decade, a shortage of competent consultants has resulted. This skill shortage is so deep that it cannot be immediately filled. Finding appropriate people and retaining them through the implementation

is a major challenge, particularly since ERP implementation demands multiple skills (e.g., functional, technical, and interpersonal skills). The software vendors and consulting firms as implementation partners must work closely with the client in comparing the ERP system to client needs. After jointly identifying discrepancies, the three parties should estimate the extent of modifications necessary and their cost.

The implementation partners must be prepared to offer substantial ongoing support for the client throughout the various stages of ERP lifecycle. Findings from several of the survey responses suggest the importance of support. Many client individuals complained that the implementation partners had problems in supporting the implementation and the post-implementation of the system. Support was a major source of conflict between customers and the vendor.

The implementation may need to evaluate the capabilities of the client and recommend special education or consulting assistance to prepare for ERP implementation. These assessments of clients' expertise, support, and implementation assistance provided by the implementation partners are most clearly related to characteristics of the client's work environment, tasks and technology, and decision-making process. These organizational features provide clues regarding client experience and subsequent needs for support. In providing this support, the implementation partner may want to calculate and include the cost of sufficient consulting help for each client organisation in its bid.

5.3 Implications for Researchers

The current study provides an exploration, description and comparison of emerging ERP lifecycle implementation, management and support issues. While the respondents were not drawn from a random sample of client organisations and consulting firms and while the number of respondents was relatively small; their views do represent a range of organisations, roles and organisational levels. The study was not intended to build or test theory but does offer some insights into needed and relevant research in the area of ERP.

This paper reports the issues and problems to be concerns in the implementation, management and support of ERP lifecycle and comparison of these issues by the stakeholder groups. For the purposes of the continuing study, and with the objective of stimulating further interest in ERP research, Table 8 offers a list of research questions compiled by the authors to guide further research based on the stages of ERP lifecycle. For example, future work should analyze the need for understanding of what factors moderate the issues produced across the various stages of ERP lifecycle? What has caused these issues and their relative importance to change over time? Note that while several of these issues are addressed anecdotally in various MIS articles (e.g., Gable et al., 1997a; 1997b and Gable 1998), very little substantive academic research has been done into these important issues.

Table 8 - Research in ERP

ERP Lifecycle Stages	Research Areas
Pre-Implementation	Should requirements be specified in the same way when selecting an ERP system, as they are for designing and developing a in-house system?
	What are the costs of switching from legacy applications to the ERP systems? Do organizations tend to fully anticipate the organizational costs of implementing an ERP systems? Are the issues the same for small packages? Large packages? All packages?
Implementation	To what extent and in what ways are ERP systems (or could they be) designed to: accommodate add-ons/front-ends/back-ends and facilitate upgrading to new versions without losing in-house enhancements. How easy or difficult is it to assess this characterist
	How do ERP testing differ from implementing in-house developed software? What differences in the roles and expertise of the implementation team do these dissimilarities suggest?
	How can ERP systems be effectively implemented in various-sized enterprises?
	What cultural or other specific contextual factors should be taken into consideration when implementing ERP systems?
	What unique characteristics of ERP systems should influence the audit of ERP systems
	To what extent does ERP systems drive BPR versus BPR driving the implementation of packages?
	Whether to, and how to, integrate other third party software with ERP systems (i.e., Whether to integrate add-ons or live with ERP functionality)?
	ERP systems represent significant complexity in terms of amount of detail, relationships, the problem of finding reusable artifacts. How should this be approached?
	How to manage the significant organizational changes resulting from the introduction of ERP systems (e.g., new processes, staff changes, broader roles, etc.)?
Post-Implementation	What unique characteristics of ERP systems should influence its post-implementation review?
	How to measure Return on Investment (ROI) on ERP related investments?
	What are the benefits that management perceive from internet/intranet enabled ERP systems?
	What factors moderate the issues produced across the various stages of ERP lifecycle? What has caused these issues and their relative importance to change over time?

6. Conclusions

While most large organisations have committed to using ERP systems in the last few years, academics have neglected to address client-centred issues and problems regarding ERP life-cycle implementation, management and support. This research addresses these concerns by comparing ERP lifecycle issues that lead to a broader understanding and implications for the stakeholder groups. Although the sample size is small, the research receives some support from the data. ERP systems remain one of the most promising solutions to integrate the complete range of an organisation's processes and functions and enables better resource planning and execution, together with improved delivery of value added products and services to customers in the shortest possible time.

Following the methodology used in this paper, conclusions are divisible into those related to the methodology used and those related to the issues themselves. For methodology, this research has found that the actual step-by-step processes for generating a meaningful set of major IS issues from diverse survey responses has not been adequately reported, regarding the data is non-numeric, generally unstructured, and often rich in perceptions in particular. The qualitative and quantitative type of data collection and analysis, the iterative processes of identifying, rationalizing, determining and comparing, have served as a guide to better understanding and facilitate the comparison of the results of the study. The methodology has proved to be an alternative approach for coping with this type of study in the context of information systems.

The current study addresses only SAP Financials, in five Australian state government agencies. The specificity of the study and these constraints, while improving the homogeneity of the sample and internal validity, limits the extensibility of the study findings. This study is expected to be extended to other ERP modules, other ERP systems, the private sector, other methodologies and other regions. The comparison analysis from this study could be extended from the exploratory stage to the explanatory stage (e.g., what are the factors that cause the issues?).

Just as this research is fundamentally built from previous IS key issues studies, it is anticipated that future studies may use the experiences and insights gained from this work. Given the rapid change the ERP systems profession is experiencing, it is important to consider any emerging issues carefully. These can be incorporated either through enhancing existing issue definitions or through the exploration of new issues. When defining the issues, care should be taken. It appears that, for example, lack of consultation related issues, when presented as normative statements, produce a halo effect because they sound very important to certain groupings. A multi-method approach, such as the one used in this research versus Nominal Group Technique, may address this bias.

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